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Efficacy of UTAUT Model in Continuation of Usage of Broadband in the Rural Areas of Northern Region of Malaysia

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Abstract

Admittedly, the internet users in the remote and rural areas are less in embracing broadband usage due to the technology and economic factors leading them in continuously using low-speed dial up access in lieu of demanding for higher services. There is no exception in the rural areas of northern region of Malaysia as their rate of development is quite low when compared with the rest of the regions in Malaysia, causing backwardness or stagnant in the usage of broadband. Therefore, this research intends to examine the fitness of UTAUT model on the broadband continuous usage in the rural areas. A quantitative survey technique is employed by distributing 200 questionnaires to secondary school students that are residing in the rural areas of northern region of Malaysia. The result shows that UTAUT model is best fit in determining continuous usage of broadband in the rural areas.

Keywords: Broadband, Continuous Usage, Rural Areas, UTAUT Model, Northern Region of Malaysia.

1. Introduction

Definition of broadband has been viewed in different directions based on belief and philosophy of individual and organization. Thus, broadband is considered as the technology that provides consumers fast and always-on access to new applications, services and content with real lifestyle and productivity benefits (Sawyer et al., 2003). The International Telecommunication Union (ITU) recommendation 1.113 of standardization sector defined broadband as "transmission capacity that is faster than primary rate Integrated Services Digital Network (ISDN) at 1.5 or 2.0 megabits per second" (ICTlogy, 2007; ITU, 2011). Meanwhile, society that adopts, adapts, and absorbs the benefits of broadband enabled information and communication technology (ICT), services and applications quickly and deeply will achieve significant benefits in terms of productivity, innovation, growth and quality of life as well as significant competitive advantage over society that do not (BSG Briefing Paper, 2004).

Pursuing this further, most of broadband applications require minimum of access speed of 50Mbit/s, which is usually common in urban areas (Yoshimoto, 2005) while the broadband services in rural areas are struggling with lower speed because of predicament of high cost of provision (Vetter, 2006). Moreover, the internet users in the remote and rural areas are less in embracing broadband access due to the technology and economic factors leading them in continuously using low-speed dial up access in lieu of demanding for higher services. Thus, there is need to seek for the strategy that helps in continuously using the broadband in the rural areas.

Besides, Muzafar et al. (2012) stresses that the rate of development among the states in the northern region of Malaysia is the least when compare with the rest of the regions in Malaysia. Indeed, the northern region of

Malaysia is also known as Northern Corridor Economic Region and comprises of four northernmost states that fall on the west coast of Peninsular Malaysia: Perlis, Kedah, Penang and North of Perak (Koridor Utara, 2007). Many of locations in the rural areas of northern region of Malaysia have their population less than 10,000 people per kilometer and consist of agricultural features, forest and water bodies. Considering the rate of broadband penetration in the northern region of Malaysia between years 2011 to 2012, there are decreases from 56.5% to 56.0% and 84.9% to 81.9% in Kedah and Perlis states, while Perak and Pulau Penang states had slight increases of 52.2% to 53.6% and 82.8% to 83.8% in broadband penetration respectively (MOSTI, 2012). This shows that there should be quest for continuous usage of broadband in that region especially in their rural areas.

In determining the factors for continuous usage of broadband in the rural areas, this study adapts the Unified Theory of Acceptance and Use of Technology (UTAUT) model and needs to investigate its fitness on the rural areas of northern region of Malaysia. Venkatesh et al. (2003, 2011) proposed a unified theory of acceptance and use of technology (UTAUT) model based on the eight models in the domain of information technology (IT). The UTAUT embedded models are joined together due to their conceptual and empirical factors and focus on the unification of users towards acceptance and usage of technology (Venkatesh et al., 2003). The UTAUT model includes the Technology Acceptance Model (TAM), Theory of Reasoned Action (TRA), Theory of Planned Behavior (TPB), Motivational Model (MM), Combined TAM and TPB (C-TAM-TPB), Innovation Diffusion Theory (IDT), Model of PC Utilization (MPCU), and Social Cognitive Theory (SCT).

2. Literature Review

Continuation of usage of a device has to do with retention of value by the users that intend to stay and actively utilize the device for exchanging knowledge and information with others (Bauer and Grether, 2005; Juyeon et al., 2012). Many researchers have added that continuation of usage of device or system is a way of measuring success in the implementation of information system (Mcknight et al., 2002; Ramayah et al., 2010). Moreover, continuation of usage of technological device (broadband) by consumers creates survival for the service technology and revenue for the firms and may be triggered by the acceptance and consumer influences towards service delivery which is the antecedent of behavioral intention (Eriksson and Nilsson, 2007; Ishola et al., 2012).

Towards the development of UTAUT by Venkatesh et al. (2003, 2011), theory of reasoned action (TRA) by Fishbein and Ajzen (1975), technology acceptance model (TAM) by David (1989), theory of planned behavior (TPB) by Ajzen (1991) and the combined TAM and TPB (C-TAM-TPB) by Taylor and Todd (1995) were used. Moreover, theory of diffusion of innovation (DOI) by Rogers (2003), social cognitive theory (SCT) by Bandura (1986), motivational model (MM) by Davis et al. (1992) and the model of PC utilization (MPCU) by Thompson et al. (1991) were also used. Meanwhile, Venkatesh et al. (2003) derived four main determinants of behavioral intention and usage as performance expectancy, effort expectancy, and social influence. Indeed, age, gender, experience and voluntariness of use moderate relationship between the variables but will not be used in the hypotheses in the context of this research as this paper gives focus on investigating the efficacy of UTAUT's main variables on continuous usage of broadband in the rural areas of northern region of Malaysia. Besides, empirical results of UTAUT model shows that it account for 70% of variance in the usage intention, which make it supersede other antecedent models of UTAUT.

3. Research Model and Hypothesis

The research model in this study has basis from UTAUT model due to the strength of UTAUT to explain the acceptance and usage of technology. Therefore, we adapt its constructs in order to test the efficacy of UTAUT on continuous usage of broadband in the rural areas as shown in Figure 1.

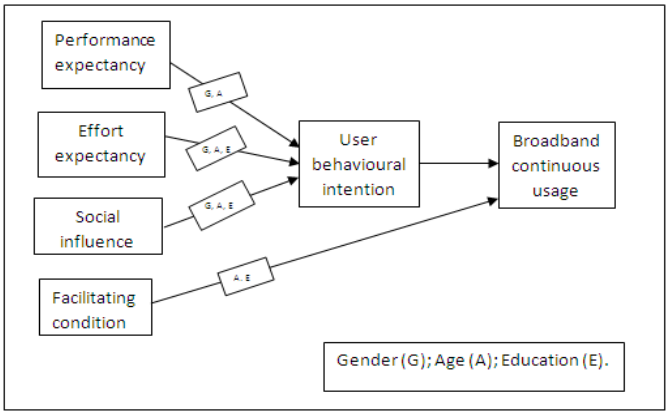

Fig. 1: Research Model

The performance expectancy is described as the degree to which an individual believes that using the system or device assist to achieve the job performance (Venkatesh et al., 2003). Many researchers (Park et al., 2007; Wan Rozaini et al., 2010; Lm et al., 2011) have agreed to the outcome derived from studies using UTAUT model and concluded that effort expectancy was found to be positively related to behavioral intention towards frequent usage of system. Moreover, effort expectancy as one of the constructs of the independent variables in UTAUT is described as the degree of ease of use of information system or devices felt by a user. Indeed, Taylor and Todd (1995), Wang and Shih (2008) perceived that effort expectancy influences the behavioral intention towards acceptance and usage of information system devices more than one time.

In addition, the degree to which an individual user feels that other people believe that he or she should be using the information system is known as social influence (Venkatesh et al., 2003). Besides, UTAUT model shows that social influence has a significant influence on the behavioral intention towards the frequent or continuous usage of IT devices in a community. In other words, Social influence construct is found to be precedent from there constructs of six models such as subjective norm (TRA, TAM2, TPB, C-TAM-TPB); social factors (MPCU) and image (DOI).

In fact, facilitating condition as one of the constructs of the UTAUT model is defined as the degree in which a user of technology believes that there is availability of technical infrastructure to support the use of new information technology (Taylor and Todd, 1995; Venkatesh et al., 2003) and thus, found to have influence on the frequent usage of information technology devices. Consequently, behavioral intention is a measure of the strength of one's intention to perform a specified behavior (Ajzen, 1991) and find its source from the theory of reasoned action. Therefore, Lm et al. (2011); Abdulwahab and Zulkhairi (2011) have shown that behavioral intention has a direct impact upon the individuals' actual use of a given technology.

Furthermore, the following hypotheses were formulated based on the previous works:

H_1: Performance expectancy will have a positive influence on the behavioral intention towards continuous usage of broadband in the rural areas.

H_2: Effort expectancy will have a positive influence on the behavioral intention towards continuous usage of broadband in the rural areas.

H_3: Social influence will have a positive influence on the behavioral intention towards continuous usage of broadband in the rural areas.

H_4: Facilitating condition will have a positive influence on the broadband continuous usage in the rural areas.

H_5: There will be a significant relationship between behavioral intention and broadband continuous usage in the rural areas.

4. Methodology

This research uses the quantitative survey technique in order to gather data from the secondary school students in the rural areas of northern region of Malaysia. The secondary school students were chosen as sample for this research because internet is found to be part of their daily routine. The total number of 200 questionnaires were distributed to the invited secondary school students at the Pusat Internet Desa (PIDs) Selama in Perak state, Balik Pulau in Pulau Penang state, Kuala Nerang in Kedah state and Simpan Empat in Perlis state. PIDs are used as the distribution and collating centers during the data collection processes. Moreover, the simple random sampling through the fishbowl style was use in selecting the respondents among the invited secondary school students at the PIDs.

The questionnaire was designed in bilingual format (English Language and Bahasa Melayu) in order to make it easier for the respondents to attempt since they are leaving in the rural areas, as they may not be versatile at English Language. Besides, the respondents were instructed through assistance of the PIDs managers in Zone 1 and Zone 2 in the northern region of Malaysia to indicate their perceptions on the amended UTAUT model, which included performance expectancy, effort expectancy, and social influence, facilitating conditions and behavioral intention towards continuous usage of broadband in the rural areas, by using 5 point Likert scale ranges from strongly disagree to strongly agree. The research model was tested by using statistical package for social sciences SPSS version 19 software.

5. Data Analysis

5.1 Overview of Respondents

The total number of 52.6% of the respondents was male students while 47.4% were female students with average age of 16 years. The data gathered shows that 68.4% of the respondents are in form 4-5, 18.4% in form 1-3 and 13.2% in upper 6 of the secondary school education. Moreover, 50% of the respondents are leaving with their parents during the academic session, while others are staying at the boarding house and with the legal guardians. Indeed, 57.9% of the respondents claimed that their parent possess secondary school education, 13.2% bachelor degree, 2.6% master degree, while 26.3% of the respondents' parents do not have educational background. Besides, 18.4% of the respondents' parents engage in rubber tapping activity to earn means, 21.1% engage in small scale businesses, 5.3% work in industry and 55.3% engage in other activities.

In addition, majority of 52.6% of the respondents say they do not have computer at home, while 65.8% do not have internet connectivity at home due to the high starting cost, lack of equipment and limited coverage of internet in their villages. Meanwhile, all the respondents are familiar with the usage of broadband either at home, school, PID or cybercafé. But, 47.4% are still using dial-up internet while 52.6% are using broadband internet. This shows that there is need to conduct research on how to ensure continuous usage of broadband in the rural areas as there is little difference between the consumption rate of dial-up internet and broadband in the rural areas of northern region of Malaysia.

5.2 Reliability Analysis of Amended UTAUT Model for Broadband Continuous Usage in the Rural Area

The reliability of the five constructed of the UTAUT model to determine the continuous usage of broadband in the rural areas was checked by using Cronbach alpha coefficient in order to test the reliability of the scale constructs. The result of the reliability shows that the entire constructs have their Cronbach alpha greater than 0.7 (0.710 – 0.814) as shown in Table 1, which is supported by Pallant (2011).

Table 1: Reliability of UTAUT Construct in the Rural Area

UTAUT Construct in the Rural Area	Cronbach alpha Coefficient
Performance expectancy	0.764
Effort expectancy	0.814
Social influence	0.717
Facilitating condition	0.734
User behavioural intention	0.710

6. Result

A multiple regression analysis is employed to explore the predicting power of independent variables in the amended UTAUT model on the dependent variable due to the continuous form of the variables involved. The amended UTAUT model for continuous usage of broadband in the rural areas contains four predictors (independent variables) and two outcomes (dependent variables), but the moderating variables do not treat in this research since respondents are male and female, belonging to the age group of 13-18 and educated. Moreover, since the intended objective is to explore the efficacy of UTAUT model on continuous usage of broadband in future in the rural areas of northern region of Malaysia, user behavioral intention is presented as binary outcome variable. Besides, user behavioral and broadband continuous usage is treated as two outcome variables. Thus, the analysis was run separately for each of the outcome variables, showing that the analysis is of two phases.

Furthermore, the first phase of the analysis uses the performance expectancy (PE), effort expectancy (EE) and social influence (SI) as the predictors to predict the user behavioral intention (UBI) towards continuous usage of broadband in future in the rural areas as shown in Table 2.

Table 2: Multiple Regressions of User Behavioral Intention of Broadband

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	8.957	1.132		7.911	.000
PE	-.252	.064	-.365	-3.905	.006
EE	.019	.077	.360	5.246	.021
SI	.684	.077	.783	8.866	.000

a. Dependent Variable: UBI

Table 2 shows that PE, EE and SI have positive influence on the UBI towards continuous usage of broadband in the rural areas with their P values below 0.05 ($\beta_1 = 0.365$, $p < 0.006$, $\beta_2 = 0.360$, $p < 0.021$ and $\beta_3 = 0.783$, $p< 0.000$) respectively, validating hypotheses H_1, H_2 and H_3. Besides, the second phase of the analysis uses UBI and facilitating condition (FC) as the predictors towards broadband continuous usage (BCU).

Table 3: Multiple Regressions of Broadband Continuous Usage in the Rural Areas

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	4.043	.735		5.501	.000
UBI	.007	.042	-.128	.167	.036
FC	-.081	.050	.321	-1.606	.002

a. Dependent Variable: BCU

The result of the analysis from the Table 3 depicts that UBI and FC significantly related to the BCU in the rural areas due to their P values that less than 0.05 ($\beta_4 = 0.128$, $p < 0.036$ and $\beta_5 = 0.321$, $p < 0.002$), making the hypotheses H_4 and H_5 achievable.

7. Discussion

The empirical test on the amended UTAUT model for continuous usage of broadband in the rural areas shows that performance expectancy, effort expectancy, social influence and facilitating condition can be used as the yardstick for continuous usage of broadband in the rural areas. Besides, user behavioral intention and the facilitating condition from the UTAUT model facilitate broadband continuous usage in the rural areas as well. Indeed, social influence has shown a great impact on the user behavioral intention towards the broadband continuous usage among the rural dwellers which is in line with researches by Lm et al. (2011), Suha and Anne (2008) and Abdulwahab and Zulkhairi (2011). This shows that the environment that the rural dwellers belong to matters most if the broadband continuous usage is to be achieved in the rural areas. This shows that the stake holders at the rural areas of the northern region of Malaysia need to be carried along in achieving the set objectives.

In addition, both of user behavioral intention and facilitating conditions were found to be significant for broadband continuous usage in the rural areas. This buttresses the necessity of resources and information which may bring about support for the rural dwellers and encouraging them to continuously using the broadband in their daily activities.

8. Conclusion

This research is specifically to confirm the strength and fitness of UTAUT model on continuous usage of broadband in the rural areas. Thus, the results of the analysis showed that UTAUT model is fit and good for exploring information system research, especially broadband issues in the rural areas due to the $p < 0.05$ of all the independent and mediating variables in the amended UTAUT model. Besides, the research has extended the use of UTAUT model beyond the state of acceptance and adoption of broadband. Consequently, this research would be conducting empirical research on the continuous intention of broadband usage in the rural areas in future which is another issue that needs to be considered in rural ICT research.

References

Abdulwahab, L. & Zulkhairi, M.D. (2011). Effectiveness of Telecentre using a Model of Unified Theory of Acceptance and Use of Technology (UTAUT): Structural Equation Modeling Approach. *Journal of Emerging Trend in Computing and Information Sciences, Vol. 2, No. 9, pp. 402 – 410.*

Ajzen, I. (1991). The Theory of Planned *Behavior. Organizational Behavior and Human Decision Processes, Vol. 50, No. 2, pp. 179-211.*

Bauer, H. & Grether, M. (2005). Virtual Community: It's Contribution to Customer Relationships by Providing Social Capital. *Journal of Relationships Marketing, 4 (1/2), pp. 91-109.*

BSG Briefing Paper (2004). The Impact of Broadband-Enabled ICT, Content, Applications and Services on the UK Economy and Society to 2010. Retrieved from http://www.broadbanduk.org/news/news/backgroundpaper, January 3rd, 2012.

Davis, F. (1989). Perceived Usefulness, Perceived Ease of Use and User Acceptance of Information Technology. *MIS Quarterly, Vol. 13, No. 3, pp. 319-339.*

Davis, F., Bagozzi, R. & Warshaw, P. (1992). Extrinsic and Intrinsic Motivation to Use Computers in the Workplace. *Journal of Applied Social Psychology, Vol. 22, No. 14, pp. 1111-1132.*

Eriksson, K. & Nilsson, D. (2007). Determinants of the Continued Use of Self-Service Technology: The Case of Internet Banking. *Technovation, 27, 157-167.*

Fishbein, M. & Ajzen, I. (1975). *Belief, Attitude, Intention and Behaviour: An Introduction to Theory and Research.* Addison-Wesley, Reading, MA, 1975.

ICTlogy (2007). Retrieved from www.ictlogy.net/review/?p=518, 17th October, 2012.

Ishola, D.M., Wan Rozaini, S.A. & Azizah, A. (2012). Conceptualising Service Quality and Technology Factor as drivers for Continuous Usage of Broadband among Rural Dwellers in Malaysia. *3rd International Conference on Network Applications, Protocols and Services, pp. 83-87.*

ITU (2011). Retrieved from www.itu.int/osg/spu/publications/birthofbroadband/faq-es.html, 17th October, 2012.

Juyeon, H., Jihun, P., Jae-Nam, L. & Jae, Y. M. (2012). Understanding Continuous Use of Virtual Communities: A Comparison of Four Theoretical Perspectives. *45th Hawaii International Conference on System Sciences, pp. 753-762.*

Koridor Utara (2007). *Northern Corridor Economic Region Socio Economic Blueprint 2007-2025*. Sime Darby Berhad, p. 10.

LM, II., Hong S. & Kang. M. (2011). An International Comparison of Technology Adoption Testing the UTAUT Model. Information & Management 48, pp. 1-8.

Mcknight, D. H., Choudhuryb, V. & Kacmar, C. (2002). The Impact of Initial Consumer Trust on Intentions to Transact With a Web Site: A Trust Building Model. *Journal of Strategic Information Systems, 11, pp. 297-323.*

MOSTI (2012). Broadband Penetration Rate by States in Malaysia. Retrieved from http://nitc.mosti.gov.my /nitc_beta/index.php/ict-indicator/broadband-penetration-rates-by-state.

Muzafar, S. H., Dayang-Affizzah, A.M. & Chin-Hong, P. (2012). Regional Income Disparities in Malaysia: *A Stochastic Convergence Analysis. Malaysia Journal of Society and Space, Vol. 8, No. 5, pp. 100-111.*

Pallant, J. (2011). *SPSS Survival Manual: A Step By Step Guide to Data Analysis Using SPSS*. Allen & Unwin, Crows Nest NSW 2065, Australia.

Park, J., Yang, S., & Lehto, X. (2007). Adoption of Mobile Technology for Chinese Consumers. *Journal of Electronic Commerce Research, Vol. 8, No. 3, pp. 196-205.*

Ramayah, T., Noor Hazlina, A. & May-Chiun, L. (2010). The Role of Quality Factors in Intention to Continue Using an E-Learning System in Malaysia. *Procedia Social and Behavioral Sciences, 2, pp. 5422-5426.*

Rogers, E. M. (2003). *The Diffusion of Innovation*. Fifth ed., Free Press, New York.

Sawyer, S., Allen, J. P., & heejin, L. (2003). Broadband and Mobile Opportunities: A Socio-Technical Perspective. *Journal of Information Technology, 18 (4), pp. 121-136.*

Suha, A. & Anne, M. (2008). The Use of the UTAUT Model in the Adoption of E-government Services in Kuwait. *41st Hawaii International Conference on System Sciences, pp. 1-12.*

Taylor, S. & Todd, P. (1995). Understanding Information Technology Usage: A Test of Competing Models. *Information Systems Research, Vol. 6, No. 2, pp. 144-176.*

Taylor, S. & Todd. (1995). Understanding Information Technology Usage: A Test of Testing the UTAUT Model. *Information and Management, 48, pp. 1-8.*

Thompson, R., Higgins, C. & Howell, J. (1991). Personal Computing: Toward A Conceptual Model of Utilization. *MIS Quarterly, Vol. 15, No. 1, pp. 124-143.*

Venkatesh, V., Morris, M., Davis, G. & Davis, F. (2003). User Acceptance of Information Technology: Towards A Unified View. *Inform. Syst. Q., 27, pp. 425-478.*

Venkatesh, V., Sykes, T. & Zhang, X. (2011). Just What The Doctor Ordered: A Reviewed UTAUT For EMR System Adoption and Use by Doctor. *Proceedings of the 44th Huwaii international conference on system sciences, Kauai, HI, USA., pp. 1-10.*

Vetter, P. (2006). The Role of Wireline Access Technology to Bridge the Digital Divide. *MUSE IST Workshop, Brussels, Belgium.*

Wan Rozaini, S.O., Yuhanis, Y., Zahurin, M. & Rohani, H. (2010). Rural ICT development. *Proceeding of third National conference on Rural Information Communication Technology Development (ICTD), Publication Malaysia.*

Yoshimoto, N. (2005). NTT's Deployment of FTTH Services and Future Developments. *FTTH Conference, USA.*